sanguinea and *Sigalion boa*, and of the Nudibranch *Ancula cristata*. In addition to the forms mentioned last week, the townettings have contained the Siphonophore *Muggiæa atlantica*, the Anthomedusa *Margellium* (*Lizzia*) *octopunctatum*, and several ephyræ of *Aurelia*, together with numbers of Teleostean ova, Prosobranch and Opisthobranch veligers, larval Lamellibranchs and *Cyphonautes*-larvæ. The Polychæte *Cirratulus cirratus* and Gastropod *Littorina littoralis* are also breeding.

THE additions to the Zoological Society's Gardens during the past week include a Vervet Monkey (*Cercopithecus lalandii*) from South Africa, presented by Mr. Walter Neall; two Red and Yellow Macaws (*Ara chloroptera*) from South America, presented by Mr. Henry Goschen; a Herring Gull (*Larus argentatus*) European, presented by Mr. W. R. Galbraith; a Bar-breasted Finch (*Munia nisoria*) from Java, presented by Mr. Sydney D. Birch; two Whooper Swans (*Cygnus musicus*) European, purchased; a Vulpine Phalanger (*Phalangista vulpina*), three Barbary Mice (*Mus barbarus*) born in the Gardens.

OUR ASTRONOMICAL COLUMN.

COMET BROOKS (NOVEMBER 19, 1892).—The following ephemeris for Comet Brooks is taken from *Astronomische Nachrichten*, No. 3142:—

1893.		R.A. (app.) h. m. s.		Decl. (app.) ° ′
Feb. 23	...	0 31 49	...	+24 18·2
24	...	33 0	...	23 59·8
25	...	34 9	...	23 42·1
26	...	35 17	...	23 25·0
27	...	36 24	...	23 8·5
28	...	37 30	...	22 52·4
March 1	...	0 38 34	...	22 36·8

COMET HOLMES (1892 III.).—Several communications with respect to the late appearances of this comet are inserted in the Comet Notes of *Astronomy and Astrophysics* for February, among which will be found one by Prof. E. Barnard. Observing with a 12-inch on the night of January 16, at 8h. 10m., he found that an estimation of the comet's diameter gave 30″, while a setting of the wires indicated 29″·4. While under observation "*the comet seemed to be perceptibly brightening*," and further measurements at 9h. 45m. gave a diameter of 32″·4. At this time he says: "The nucleus had developed clearly, and was very noticeable as a small, ill-defined star." With the 36-inch, which he was able to use later, he made the following measures, which we reproduce here, as they are quite unique in showing the increase in diameter of a comet due evidently to some external impact:—

Standard Pacific time. h. m.					Diameter. ″
10 29	...	...	...	...	43·4
10 30	...	...	...	...	44·9
10 31	...	...	...	...	43·6
10 42	...	...	...	...	47·8
10 43	...	...	...	...	47·9
10 45	...	...	...	...	46·0
11 13	...	...	...	...	47·3
11 15	...	...	..	...	46·1

In concluding his remarks he says: "This is certainly the most remarkable comet I have ever seen, taking everything into consideration."

The following is the ephemeris for this week:—

Greenwich, Midnight.

1893.		R.A. (app.) h. m. s.		Decl. (app.) ° ′ ″
Feb. 23	...	2 19 4·4	...	+34 31 7
24	...	20 44·6	...	33 36
25	...	22 25·5	...	36 9
26	...	24 6·4	...	38 42
27	...	25 48·0	...	41 18
28	..	27 29·6	...	43 54
March 1	...	29 11·9	...	46 34
2	...	2 30 54·3	...	34 49 13

SOLAR OBSERVATIONS AT ROME.—In the *Memorie Degli Spettroscopisti Italiani* for January, Prof. Tacchini communicates the observations made at the Royal College with respect to the various phenomena observed at the solar surface during the third trimestre of 1892. Dealing first with the prominences the total number for each of the months are respectively for north latitudes, 182, 129, 120, total 431; and for south latitudes 141, 167, 185, the total number here amounting to 493. The balance here is in favour of the southern hemisphere for greater frequency, but a curious fact may here be remarked, and that is that the maxima for the north and south latitudes occur in the months of July and September respectively, each exceeding considerably the number of prominences recorded for the same month in the opposite hemisphere.

The greatest frequencies occurred in latitudes (+60°+70°) and (−50°−60°). The groups of spots seem to have predominated slightly in the southern latitudes, the record showing 49 against 41; at the equator as many as 13 for zone (0°+10°) were seen, the zone (0°−10°) showing only 4; the relative frequency occurred here in the same zones in both hemispheres (±10°±20°).

With reference to eruptions, the month of July contains the only records, six for the northern, and three for the southern hemisphere, four of these taking place in zone (+10°+20°).

Prof. Tacchini also has a note on the great prominence of November 16 last, in which he describes in detail the numerous observations which he was fortunate to procure. Although one can gather a good idea of the rapidity of the ascent from the table, the figures which accompany it show in a striking manner the great changes of shape that was such a conspicuous feature in its ascent. At 9h. 0m. on the 16th the height was only 131″·8, but at 1h. it had reached 319″·2, and at 1h. 35m., 534″·3, this being its maximum height. It is interesting to notice the numbers showing the increase of altitude in *one* minute of time.

For instance, at 11h. 55m the increase of altitude per minute was 0″·56, at 1h. 4m. it was 6″·75, decreasing from this value to 4″·34 at 1h. 27m. At 1h. 32m. the velocity of ascent was increased, the value amounting to 9″·72, but at 1h. 34m. the increase of altitude reached its maximum, 20″·80, showing the ascent per minute.

THE STAR CATALOGUE OF THE "ASTRONOMISCHE GESELLSCHAFT."—The Harvard College Observatory has now completed the task of cataloguing the zone of stars undertaken in connection with the great catalogue of the *Astronomische Gesellschaft*. The stars included number 8627, and lie between 49° 50′ and 55° 10′ north declination, and the positions are reduced to the epoch 1875. Most of the observations were made by Prof. Rogers during the years 1870–1884, and the reductions have throughout been in his charge. The publication appears simultaneously as vol. xv. part ii. of the *Annals of the Harvard Observatory*, and as one of the volumes of the *Gesselschaft*. All concerned are to be congratulated on the completion of the zone, which involved over twenty-six thousand observations and an immense amount of calculation.

NOVA AURIGÆ.—Mr. Fowler draws attention to the fact that the nova is still as bright as ninth magnitude, and therefore easily visible in comparatively small telescopes. Its spectrum seems to consist of the two bright nebula lines near wave-lengths 5006 and 4956. The latter is only slightly fainter than that at 5006.

PARALLAX OF β CYGNI.—Mr. Harold Jacoby, whose work on the reduction of the Rutherford photographic measures of the stars about β Cygni we have previously referred to, suggests in *Astronomical Journal*, No. 287, that the discrepancies in the results can be explained on the hypothesis of a parallax of β Cygni amounting nearly to a whole second of arc. To investigate this he has chosen five pairs of comparison stars, from which he has computed the parallax from each pair separately by "using the difference of the distances of the two comparison stars from β as the quantity from whose variation the parallax should appear;" in this way he has obtained the weighted mean for the parallax to be + 0″·97, a value which, if endorsed by further observations will show us that of all stars β Cygni is one of our nearest neighbours.

GEOGRAPHICAL NOTES.

MR. G. B. GRUNDY, of Brasenose College, the student in geography appointed jointly by the University of Oxford and the Royal Geographical Society, has made a careful survey of the battlefield and site of the town of Platæa and of Leuctra,

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in Greece. He is now engaged in preparing a comprehensive memoir on the subject which may be expected to throw new light on some questions of historical geography.

Mr. Mackinder, in his fifth lecture for the Royal Geographical Society's education scheme, spoke of the chief lines of communication between Asia and Europe and the ways by which successive bands or hordes of Asiatic invaders forced a passage into the heart of Europe. The routes across Asia Minor from the Gate of Cilicia to the northern waters, and the thoroughfare through the Balkan peninsula now traversed by the international railway, were shown to have guided the movements of peoples and the formation or dissolution of nations from the dawn of European history on to the present day.

The United States appears to have entered the field as an aggrandising power, taking up territory beyond the limits of the continent of North America. The annexation of Hawaii seems likely to be effected without remonstrance, and a footing has also been obtained in San Domingo, the eastern part of the island of Haiti.

Mr. A. Vaughan Williams has been exploring the region round the mouth of the Sabi River in south-east Africa. He has ascended the stream for thirty miles to the limit of tidal influence.

The orthography of African place names is a perpetual source of confusion. It appears that in place of Zimbabwe or Zimbabye we ought, in order to render the sound of the word used by the people surrounding the ruins, to write "Zimbabghi." The familiar name Mashonaland is in itself a corruption of the native name, but is always pronounced Mashunaland, a pronunciation to which the spelling ought to conform.

Railways seem likely at last to become established in China. The line from Teintsin to Taku has now been extended to the River Lan, a total distance of 130 miles, and is being rapidly pushed northward, a considerable section being already opened for passenger traffic.

CAPTAIN BOWER'S JOURNEY IN TIBET.

At an extra meeting of the Royal Geographical Society, on Monday night, Captain H. Bower described his recent journey with Dr. Thorold across Tibet from west to east. They set out from Leh on June 14, 1891, and were fortunate enough to get well into Tibet before meeting any natives. Travelling due east they crossed a pass of 18,400 feet, on the other side of which lay the Horpa Cho, the highest lake yet met with in Tibet, and probably the highest in the world, its altitude being 17,930 feet. Along the route eastward many other lakes were passed, all salt and without outlet, the want of fresh water being sometimes severely felt; a kettleful of hailstones was a welcome catch on one occasion. The travellers used ponies and donkeys for carrying their loads, as yaks do not eat grain, and grass was often not met with for many days' journey. At length, after travelling east and south-east for about 700 miles, they were stopped within 200 miles of Lhasa by the Tibetans, who paid no attention to Chinese passports, and after much parleying insisted on a complete change of route. The party had to retrace their steps for several days' march, turn northward, and then make their way east at a safer distance from the capital. It was now the month of October and the crossing of passes over 18,000 feet, with temperatures of 15° or more below zero, in strong wind was extremely trying. About the end of November, for the first time for four months, the tents were pitched at a less altitude than 15,000 feet, and soon afterwards Chiamdo was reached. Here great difficulty was experienced with the lamas, who insisted that no European should enter the town; but by the intervention of the Chinese Amban, whose power was really but slight, the party was allowed to proceed, passing round the outside of the town. From Chiamdo to Batang the way was easy, and no difficulties were experienced thereafter. At Ta-Chen-Lu they entered China and reached Shanghai on March 29, 1892. Throughout Central Tibet the authorities disclaimed the sovereignty of China, maintaining that only the grand lama had jurisdiction in that region. Many of the lamas met with were educated and intelligent men, but not inclined to give information. Much difficulty was experienced in getting the names of lakes and mountains, no two Tibetans giving the same answer. The fanaticism and distrust of the people created constant difficulties, but Captain Bower, under the pretext of being a Buddhist with a peculiar ritual, succeeded in making observations for position openly as part of a religious service, previous attempts to do so by stealth having failed.

THE CHEMISTRY OF OSMIUM.

An important addition to our knowledge of the chemical nature of this interesting element is contributed by Prof. Moraht and Dr. Wischin, of Munich, to the current number of the *Zeitschrift für Anorganische Chemie.* Two years have scarcely elapsed since the position of osmium in the periodic system was finally decided by the painstaking re-determination of its atomic weight by Prof. Seubert. Previous determinations of the atomic weight of osmium had been made with material which Seubert subsequently showed to be impure, and in consequence the erroneous value, 198·6, had been ascribed to it. Indeed previous to the year 1878 the order of precedence as regards atomic weight of the four metals of the platinum group --gold 196·2, iridium 196·7, platinum 196·7, and osmium 198·6 —was entirely at variance with the order demanded by their chemical and physical properties, and a standing contradiction of the periodic law of Newlands and Mendeleef. In that year, however, Seubert attacked the case of iridium, and as the result of a series of determinations, made with the laborious care which has characterised all his work, the atomic weight of this metal, when obtained in a pure state, was shown to be 192·5, a number very different to that previously assigned to it, and which was afterwards remarkably confirmed, even to the decimal place, by an independent investigation by Joly. Three years later Seubert made his celebrated re-determination of the atomic weight of platinum, which resulted in the number 194·3 being finally derived for the true atomic weight of the perfectly pure metal. This value was likewise subsequently confirmed by Halberstadt. In the year 1887 the position of gold was decided by simultaneous independent re-determinations of its atomic weight by Thorpe and Laurie in this country and Krüss in Germany, the two values being practically identical, 196·7. Lastly, in 1891, Seubert completed his work by re-determining the atomic weight of osmium with a specimen of the metal of practically perfect purity, with the result that the old number, 198·6, was found to be entirely erroneous, due to considerable quantities of impurities being present in the samples previously employed, and that the real value of this constant was 190 3, thus removing osmium from its former situation at the end of the series and placing it in its proper position at the head of it.

The order of precedence of the metals of the platinum group is therefore as follows :—Osmium 190·3, iridium 192·5, platinum 194·3, and gold 196·7. This order is in full accordance with the relative chemical and physical properties of these metals, and the last outstanding exception to the periodic generalisation has disappeared.

Although the properties of pure metallic osmium, and particularly its atomic weight, are now known with certainty, the nature of its compounds is yet very little understood. Moreover, it is evident from the result of the investigation of Prof. Seubert that previous workers have been dealing with an impure metal of atomic weight, 198·6. It was therefore desirable that not only should the chemistry of this element be extended to compounds hitherto uninvestigated, but that the composition and properties of the compounds already known should be subjected to a re-examination.

Prof. Moraht and Dr. Wischin have therefore taken up the study of the compounds of osmium with oxygen, sulphur, and the halogens, employing material of a very high degree of purity, and the results of their investigation are both novel and interesting.

Work with osmium compounds is endowed with peculiar personal danger to the chemist, owing to the great facility exhibited under the most various conditions for the formation of the tetroxide OsO_4, a substance which boils at 100° C., and is very volatile at the ordinary temperature, and which attacks the skin, the lungs, and particularly the eyes with most serious consequences.

The material started with was a comparatively pure sample of the best known salt containing osmium, potassium osmate, $K_2OsO_4.2H_2O$. This salt was further purified by distillation

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